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ABSTRACT

This two-part learning module was designed to help instructors in making effective use of questioning techniques in promoting the classroom involvement of non-traditional students. Part I identifies the characteristics and uses of three different types of questions: (1) convergent, eliciting questions, which are designed to verify student retention of factual information; (2) divergent, eliciting questions, which are designed to allow a variety of answers and which require the student to defend a position or develop a hypothesis; and (3) probing questions, which are designed to follow up on initial student responses by probing for the correct answer or seeking an extension, clarification, or justification of a student's response. Included in this section is a discussion of the relative merits of three intellectual levels of questioning: the knowledge level, which requires the student to rely upon memory for recalling facts; the application level, which requires the student to apply previously learned information to specific examples; and the problem-solving level, which requires the student to develop appropriate alternatives to new situations. Part II presents a series of exercises to help instructors apply the concepts of questioning techniques to the construction of questions for classroom use. A pre-test and several post-tests are provided. (JP)

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QUESTIONING AS A TEACHING TOOL

by

Carolyn Thompson

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QUESTIONING AS A TEACHING TOOL

(Preliminary Edition)

by

Carolyn Thompson

The Media Systems Series in Creative Teaching

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Involved in any deep communication between persons is the ability to ask appropriate questions and to listen. This is the genius of communication. To listen and question at just the right place and degree delimits the truly brilliant instructor from the average. An insightful question appropriately delivered may stimulate the individual to reach a new level of mental meditation. We learn to think only by thinking. We become creative only by having opportunities to be creative. A properly phrased question often is the necessary "input" needed to ignite the student's thinking and creative processes....Clearly, the questions a teacher asks can make the difference between an antiquated wasteland and an exciting learning environment. (Carin, 1975:2)

Questioning as a Teaching Tool

(A Self-Study Unit)

I. Introduction

Non-traditional students are a clientele that community and junior colleges are serving more and more. If these students represent our clients, our target-group, (and the reasons for our jobs), how do we keep them in school long enough to satisfy their needs?

Certainly providing relevance and involvement is one key to retaining these students. This module represents one technique teachers can use to make learning more participative. Effective questioning will involve the students not only in the class but in their own learning. It is an integral, constructive part of the teaching process that can encourage students to develop higher levels of thinking, enabling them to utilize, not just possess, information. Questioning is based on the premise that "True learning begins by not knowing the answer."

In terms of the learning process, however, questioning is an activity that all too often is interpreted by students or designed by instructors to be akin to the Inquisition rather than as a vital, integral part of teaching and learning. Every student has no doubt felt the tension, anxiety, or vague uneasiness caused by waiting for the questions directed at him by an instructor, especially when the instructor's response is all too predictable if given a wrong answer. Too many instructors have been guilty of using questioning as an interrogation tool to embarrass an unsuspecting student or to humiliate a student who does not have the right answer.

Instructors who use questioning only in this way are not taking advantage of an excellent teaching tool that can fulfill many instructional purposes, including:

- arousing student interest and motivation *
- evaluating student preparation
- checking student comprehension of assignments, materials
- diagnosing student strengths and weaknesses *
- reviewing and summarizing
- encouraging discussions
- directing students to new possibilities for solutions to problems *
- stimulating students to seek additional data on their own
- building up the individual student's self-concept *
- helping students see applications for previously learned material
- assessing whether or not the goals and objectives of a lesson have been achieved. (Carin, 1975:24)

In light of these purposes, then, questioning as a part of the teaching process becomes not only a method of assessment and evaluation, but also a factor in classroom, laboratory, or clinic management, and an influence on the thinking processes of students and on the social and emotional climate of the learning situation. (Hyman, 1974:291)

Looking back at this list, notice that besides dealing with depth and breadth of knowledge, several purposes specifically affect motivation, self-concept, and life skills learning. Non-traditional students in classes where these techniques are used will reap additional benefits above and beyond content.

The ability to use questioning effectively is not a talent that is possessed instinctively only by "good" teachers; it is a skill that can be developed through planning and practice. Effective, appropriate questioning involves not only the number of questions asked, but, more importantly, the levels and types of questions, the methods used in asking them, and the attitudes and methods of the instructor in dealing with student responses.

In order to help the instructor develop this skill this module has two parts: Part A--Learning the Concepts discusses the different types of questions and their uses; and Part B gives the learner/reader practice in constructing questions employing his/her new knowledge.

II. Rationale

Questioning can be a powerful teaching tool in any classroom. The previously mentioned purposes for questioning make this technique especially apt when dealing with the non-traditional student.

PART A: LEARNING THE CONCEPTS

I. Study Questions (Pre-Test)

1. What are the characteristics of the two types of eliciting questions?
2. What are the characteristics of questions at the Knowledge, Application, and Problem solving levels?
3. Identify and discuss the application of probing questions.

II. Key Concepts

eliciting questions

convergent

divergent

knowledge level

application level

problem solving level

probing questions

prompting questions

III. Learning Objectives

Goal: to be able to show understanding of the types of questions, their characteristics, and uses. Given the written portion of this unit and the practice included herein, the learner will be able to

1. List in writing five instructional purposes fulfilled by questioning.
2. Describe in writing the characteristics of the two types of eliciting questions.
3. List in writing the characteristics of questions at the Knowledge, Application, and Problem Solving levels.
4. Identify in writing examples of questions.
5. Identify and discuss in writing the application of probing questions.
6. Identify and discuss in writing the application of five classifications of probing questions.

IV. THE MECHANICS OF QUESTIONING

A. Eliciting Questions

What is an eliciting question? It usually is the first question that the instructor asks students about a particular subject and is one that will likely be followed up with other related questions. It may be the first question asked during a learning activity, or it may be a question which changes the topic or train of thought during the activity. Depending on student responses, eliciting questions may be followed up with probing questions. (Probing questions are discussed in greater detail on pages 27-32.)

Eliciting questions are categorized as either convergent or divergent. Each of these categories demands a different level of thinking from the student in order for him to respond appropriately. (Carin and Sund, 1971:111)

Convergent questions require low-level thought processes from the student. These responses are predictable and usually specific, short, and factual. Such questions can be used in reviewing material and verifying student retention of knowledge. Convergent questions asks the student to

- answer yes or no
- compare
- contrast
- define
- designate
- explain
- identify
- name
- state relationships

Convergent questioning can be used to promote in identification and grouping of relationships - the first step in developing concepts. A higher level of thought process then becomes involved in responding. Some examples of convergent questions are listed below.

In artificial respiration, an adult patient should receive how many breaths per minute?

Explain the procedure for timing an automobile engine.

What is the difference between a run-on sentence and a comma slice?

What is the most common example of a carcinogenic substance?

What were three different causes of the Mexican-American War?

Why wouldn't an instructor want to use only convergent questions?

Your answer should say something like "Convergent questions ask only that the student feeds back memorized facts, a low level of learning."

Divergent questions are designed to allow and encourage a variety of responses. They are more thought-provoking than convergent questions and responses to such questions are not as predictable. Divergent questions ask the student to employ higher level thinking to develop applications, alternatives, insights, appreciations, and attitudes that are new for him/her.

Divergent questions ask the student to

- defend
- hypothesize
- infer
- judge
- justify choice
- predict
- reconstruct
- value

The following are examples of divergent questions.

What policies and procedures could be established to prevent recurrence of multi-million dollar fraud discovered within the GSA (Government Service Administration)?

Do the courts have the right to demand and examine a reporter's private notes about sources?

How would you defend or refute this statement: "The United States caused the Mexican-American War."

You discover that a patient's full mouth survey has been lost. The patient was reluctant to have the procedure done initially. The X-rays are necessary for accurate diagnosis. How would you proceed with this patient?

Exercise 1

Categorizing eliciting questions as either convergent or divergent is the simplest way to make a distinction in their purposes. In the following exercise identify the questions as being either convergent or divergent by placing "C" or "D" in the spaces provided.

_____1. What is the normal body temperature on the Celsius scale?

_____2. What relationship does tuning have to gas mileage?

_____3. What changes do you forsee in the role of vocational nurses during the next five years?

_____4. What is the equation for the reaction between carbon dioxide and water?

_____5. A self-employed businessman uses a corner of the family den for his office. Why would you deduct or not deduct this space on his income tax statement?

_____6. How would you support the view that "Las Meninas" is Velasquez' finest painting?

_____7. What suggestions do you have for making the laboratory component of this course more useful for students next semester?

ANSWERS TO EXERCISE 1:

Numbers 1,2, and 4 are convergent ("C"). Basically, they request recall of knowledge and relationships. Whereas 3,5,6, and 7 ask students to hypothesize, predict, justify choice, defend, and value.

The next section takes the distinction of purpose a step further to deal with the classification of questions according to a hierarchy of levels.

Exercise 2 (Partial Post-Test)

1. Recall the instructional purposes fulfilled by questioning. List five below.

   1.

   2.

   3.

   4.

   5.

2. Describe the characteristics of the two types of eliciting questions.

ANSWERS TO EXERCISE 2:

1. See page 2.

2. See pages 7 - 9.

B. Levels of Questions

To respond to a question, the student must go through a particular mental process. That process might be remembering a specific fact, establishing a relationship that exists among a collection of facts, applying the usefulness of what he remembers to a specific situation, or developing an original idea. Since a given question triggers a specific level of thinking, questions may be classified according to the mental processes students go through in formulating responses.

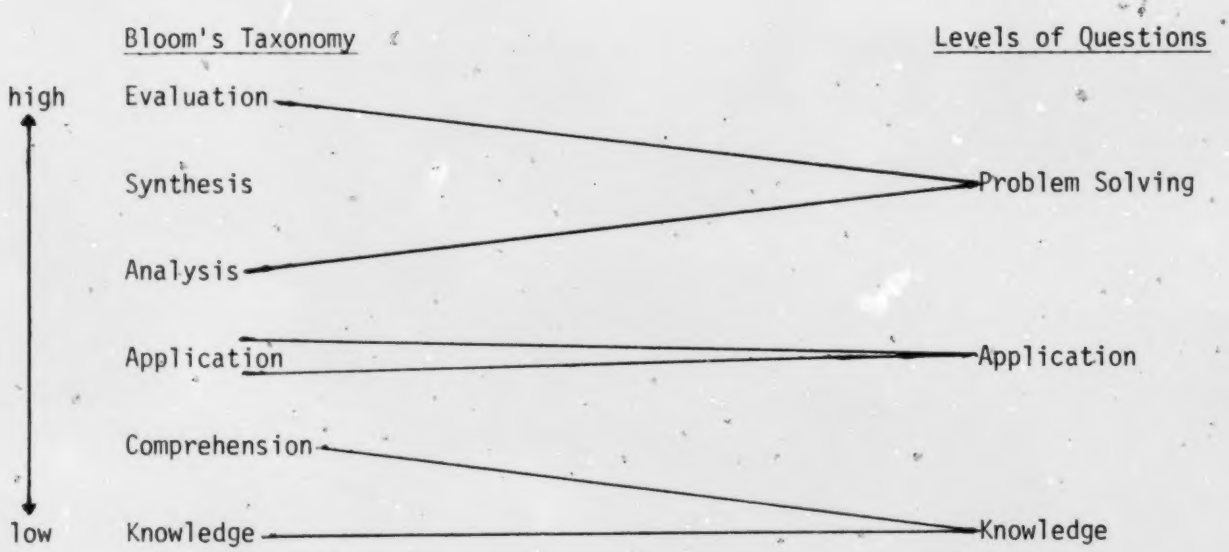
For example, if the instructor wants to determine whether or not the student can use the proper method to take a patient's blood pressure, he will not ask the student to define systolic and diastolic pressure - he will ask the student to do the procedure. If the instructor wants to know whether or not a student would continue or discontinue a certain regimen for a hypothetical patient, he will ask the student to make a judgment; he will not ask the student to describe the patient's condition.

In each of these examples, the instructor is asking the student to exercise certain thinking abilities. In the first instance, the student must not only remember the sequence of steps in taking a patient's blood pressure, he must also be able to apply those steps in a real situation. In the second instance, the student must analyze both the patient's condition and the existing prescribed regimen, remember what he has learned about that condition, and then decide if the prescribed regimen is valid.

Instructors can use questions to lead students through all levels of thinking, from simple remembering to high-level critical thinking. Unfortunately, however, the focus of questioning is often at the simplest level - asking students only to remember and repeat what they have learned.

This module deals with three levels of questions: Knowledge, Application, and Problem Solving. These levels are based on Benjamin Bloom's Taxonomy of Educational Objectives. (See Kellogg Project's "Writing Higher Level Learning Objectives: The Cognitive Domain.") The three levels build upon each other to form a hierarchy, with the Knowledge level serving as a foundation for working at the next two levels. To respond to an Application question, the student must remember the information involved, which implies that he can also work at the Knowledge level. In dealing with a Problem Solving question, the student must remember the information and be able to use it; to go through a decision-making or evaluation process. Each of these three levels will be discussed separately in the next few pages.

LEVELS OF QUESTIONS



The context of a question often helps determine its classification at a particular level: factors to be taken into consideration include the instructions preceding the question and the knowledge of the subject that the student brings with him into the classroom. It cannot be assumed, then, that one question will lead to the same thought process by each student in the class. Nor can it be assumed that questions beginning with "how" or "why" necessarily lead to higher level thinking by the students. Depending on the student's previous instruction, such questions may be classified at different levels.

The value of classifying questions according to various levels is not in the instructor's ability to identify the levels nor in his ability to classify given questions by those levels. The value is in his utilizing that knowledge to formulate questions that by design will require students to experience a range of thought processes to arrive at appropriate responses.

Knowledge level questions. The majority of questions asked by instructors fall into the Knowledge level. Questions at this level (the lowest level of questioning) simply determine that the student possesses and understands basic information. Responding to Knowledge level questions requires only that he repeat in some form what he has learned. It is not expected that the student will include in an answer more than what he has learned from the instructor, a textbook, or some other source of information.

Knowledge level questions can ask the student to rely on his memory to recall or recognize facts, definitions, formulas, or sequences. They can ask the student to translate information from one form into another by paraphrasing or summarizing what he has learned. Or they can ask the student to interpret previously studied information by comparing and contrasting given entities, by relating facts or definitions or values, by recognizing cause-and-effect relationships, or by recognizing implications of given data.

The student may respond to Knowledge level questions that ask him to recall or translate information without really understanding the information itself; he can answer from memory only. But if the student is called to interpret that information by establishing or recognizing relationships and implications, he must exhibit his comprehension of what he has learned. For instance, an instructor might ask these two questions that require students to recall information:

What is the definition of "food"?

What is the definition of "nutrition"?

In order to respond, students simply repeat to the instructor the definitions they have learned for the two words. The instructor might, however, follow up those two questions with another question:

What important difference is implied between these two definitions that establishes their relationship?

In order to respond, students must now exhibit their ability to interpret the information contained in the definition of "food" and "nutrition."

Knowledge questions do not require from the student as much thinking as other levels of questioning, but they are important. They serve a distinct purpose by determining the student's possession and understanding of basic, essential information. In some professions, it is important that certain skills must be performed in an established sequence of steps, or formulas must be prepared in standard proportions. Knowledge level questions can determine whether the student has learned the essential basic information that is a prerequisite for more complex thought processes.

In addition to focusing on facts, definitions, and formulas, Knowledge level questions are also useful in checking how a student would act in

ethical situations that demand appropriate responses. For example, if it is an institutional regulation that physical therapists are not to discuss or explain medication to the patient, his relatives, or friends, and the student knows this, you might present the following question:

> Mr. Brown is in therapy to increase the mobilization of his wrist. He asks you why he is taking pink pills instead of the green capsules he you used to take. You know why his medication has been changed. What do you tell him?

The student should respond by saying that he would tell the patient to ask his physician. This use of knowledge level questioning allows the student to simulate mentally an ethical situation before actually being exposed to it in the clinic or on the job. Knowledge level questions should reflect material that you expect the student to remember long after he has become a professional. But, if the fact, formula, or sequence is rarely used, it may be better for the student to be able to tell you where he can find the information rather than to spend the time memorizing it. Student time spent memorizing information may be used more efficiently for learning other more important material.

Knowledge level questions require the student only to repeat in some form what he has learned, either through recall/recognition, translation, or interpretation of basic information. The following key words often appear (or their operations are implied) in Knowledge level questions:

associate	differentiate	name	review
compare	distinquish	paraphrase	show
contrast	identify	recognize	state
define	indicate	repeat	summarize
describe	list	restate	tell

Examples of knowledge level questions from various areas follow. (The reader may assume that each question is based on the student's previous instruction in that topic.)

Examples Knowledge Level Questions

1. What is the difference between a simile and a metaphor?
2. Define discontinuous (Line) spectra.
3. What are the criteria for a correct flame spectra identification?
4. How does the tone of the stomach affect gastric location?
5. Compare the qualities of a proton with those of an electron, and with those of a neutron.
6. What is the standard procedure or sequence for rotating radial tires?
7. Describe Lord Rutherford's gold foil experiment and its results.

Application Level Questions. Questions at the Application level require a student to use the information he has learned previously by applying it to specific examples or situations. This facilitates the development of a life-skill in the student.

Application questions are the second level in the hierarchy, since they require the student first to remember and understand the information involved, and then to pull that information together and apply it to a situation that approximates real life. For example, after attending a class on plaque removal, a student should be able to answer questions on how to change his tooth brushing habits by using the plaque removal information.

Application questions serve a distinct function in assessing a student's ability to transfer and use the information that he may be able to repeat to the instructor at the Knowledge level. After studying Vitamin C, for example, the student may be able to tell the instructor that heat is one way that Vitamin C is destroyed. When time-saving food preparation tips are discussed

in class, the instructor suggests that frozen orange juice concentrate can be diluted more rapidly by using boiling water and then asks the students if they see anything wrong with this method. The students should be able to tell the instructor that boiling water will destroy the Vitamin C. If they cannot recognize this problem, they cannot apply the information that Vitamin C is destroyed by heat.

Application questions also help students remember what they have been taught because they are now asked to use the information they have learned. By having students use information, the instructor provides them with concrete reasons for learning the information, which can further motivate the students to learn. If no direct job or personal application is seen for the information learned, it may become more difficult for students to remember.

The following key words often appear (or their operations are implied) in Application questions.

calculate	illustrate	record
demonstrate	locate	set up
draw	measure	sketch
employ	operate	solve
estimat	perform	trace
give an example	prescribe	use

Sample questions at the Application level follow.

Examples Application Level Questions

1. What procedure would you prescribe to set up a family budget for a young couple with two children? (husband: employed full-time, wife: half-time, children: ages 2 and 4)

2. Describe the function of each part as you demonstrate how to operate a Dictaphone Electronic Dictating/Transcribing System.

3. Demonstrate the truth of the following statement, "The U.S. space program has benefitted man in many areas besides space technology."

4. On paper employ the office design techniques just discussed to make necessary changes in this office floor-plan.

5. How could the standard bed-making procedure be modified for a sick person at home?

6. Calculate the rate of depreciation on a $42,000 duplex with a $10,000 downpayment, and a 40-year mortgage.

7. Illustrate why the Germans were at first so effective in their blitzkrieg to conquer western Europe.

Problem Solving Level Questions. As indicated by its very name this is a complex and essential ability for a person to develop. Each situation an individual faces has its unique characteristics. To deal with a given situation, the individual must be able to sort through the knowledge he has and determine its relevance to the situation. He must recognize characteristics of the new situation that are related to previous situations he has encountered; then he must use, with appropriate modifications, the correct knowledge and method to deal with the situation. The ability to go through this process surpasses simple remembering and applying previously learned information to specific situations; it involves the intellectual ability to attack problems and make decisions by adapting knowledge to new situations. (Weigand, 1971:86-88)

The development of this intellectual ability must be fostered in all students. To do that, instructors must provide opportunities for students to exhibit not only their abilities to regurgitate or use specific information, but also provide practice opportunities for demonstrating abilities to examine situations and problems critically and make decisions on the most appropriate alternatives or courses of action. Problem Solving questions provide those

opportunities in classroom, clinical, or laboratory teaching situations.

Problem Solving questions are at the highest level of the questioning hierarchy, since they require students to utilize critical thinking abilities. Mental processes involved in responding to Problem Solving questions include analysis, synthesis, and evaluation.

> When analyzing, the student breaks down a topic or situation into its component parts for examination.
>
> When synthesizing, the student reorganizes component parts in order to create an alternative, solution, or statement that is new to him.
>
> When evaluating, the student makes a judgment, chooses the best alternative or solution, and justifies or defends his choice.

Problem Solving questions ask students to determine and consider alternatives. In doing so, they require students to think at the highest levels of critical thinking and are usually considered to be the "hard" questions. To respond to such questions, students must have abilities to deal with the other two levels of questioning (Knowledge and Application) and then must incorporate information and mental processes to analyze, synthesize, and/or evaluate. An example of this process follows.

> In a beginning psychology class the textbook states that one way to "extinguish" an unwanted behavior is positive reinforcement.
>
> The instructor might ask this Knowledge level question: What is one way to extinguish undesirable behavior?
>
> To assess student ability to use this information, the instructor might ask this Application level question: A child you are staying with is making too much noise. What do you do?
>
> At the problem solving level, the instructor might ask: You are baby-sitting a 4-year-old child for a week. The first night when you put him to bed, he cries incessantly for nearly 30 minutes. What would you do in the time you have to solve the problem?

The Knowledge level question does not allow the instructor to determine

whether or not the student knows how to use his or her knowledge of positive reinforcement. The Application level question requires the student to indicate he knows what to do by giving an example of the type of positive reinforcement he would use to quiet the child. The Problem Solving question requires the student to analyze the situation and determine alternative solutions to the problem. Given only a week the student might offer to read a story in return for no crying before bed. He might offer a bedtime snack, play a game, watch TV a little or he might use a combination of the above as necessary to satisfy the child. The instructor's purpose in asking the Problem Solving question was to give the student practice in determining a course of action in a situation that was far from ideal. This also gives the student practice transferring his knowledge into a situation in which he might actually be involved.

There are many advantages in this type of exposure. The student will certainly be better able to handle similar future situations. (The students might be asked to come up with the situations that they feel most likely to happen based on future job or personal circumstances.) Also, however, if the student feels he can really apply his knowledge, the instructor has guaranteed better retention, increased interest, greater involvement in learning, and greater ease of learning. These things are important to all students but are especially beneficial to the non-traditional student.

The following key words often appear (or their actions are implied) in Problem Solving questions.

advocate	criticize	judge
assess	debate	justify
challenge	decide	organize
choose	defend	plan
compose	derive	propose
conclude	design	rank
construct	formulate	recommend
create	infer	suggest

The following are questions at the Problem Solving level.

Examples Problem Solving Questions

1. How would you defend or refute the statement: "The Death Penalty is legalized murder."

2. What suggestions do you have for making the laboratory component of this class more useful for the students coming in next semester?

3. Some proponents of fusion predict that it will be a major energy source by 2025. How realistic is this prediction?

4. Working in small groups, propose a plan for articulating agreements between this community college's building trades students and the trades represented in this town.

5. During your assigned visit with the terminally ill patient, was the presence of the chaplain a facilitating factor? Why or why not?

6. Look at the goals and objectives for the rest of this semester for this English class. Delineate how you plan to accomplish them by the end of the semester. Include not only the means and products, but also a proposed time table.

7. How do empathy, trust, caring, and anxiety fit into the health care worker-patient relationship?

Questioning

Levels	Key words
Knowledge level:	associate, compare, contrast define, describe, differentiate, distinguish, identify, indicate, list, name, paraphrase, recognize, repeat, restate, review, show, state, summarize, tell
Application level:	adapt, apply, calculate, demonstrate, draw, employ, estimate, give an example, illustrate, locate, measure, operate, perform, prescribe, record, set up, sketch, solve, trace, use

Problem Solving level:	advocate, assess, challenge, choose, compose, conclude, construct, create, criticize, debate, decide, defend, derive, design, fomulate, infer, judge, organize, plan, propose, rank, recommend, suggest

---

Exercise 3 (Partial Post-Test)

1. List the characteristics of questions at the Knowledge, Application, and Problem Solving levels.

2. What kinds of questions would you use to review material or to test student retention?

3. Justify your answer below.

4. What levels of questions are #2 and #3 above?

   #2 _____

   #3 _____

5. If each of the following key words were included or implied in a question, indicate in the space provided at which level you would classify the question itself. (K=Knowledge, A=Application, PS=Problem Solving)

   _____a. suggest

   _____b. describe

   _____c. estimate

   _____d. paraphrase

   _____e. defend

   _____f. illustrate

   _____g. create

   _____h. summarize

   _____i. demonstrate

   _____j. plan

   _____k. compare/contrast

   _____l. measure

ANSWERS TO EXERCISE 3:

1.A. Knowledge level: basic recall of content presented in class, textbook, etc. (p. 13)

B. Application level: student uses the information. He shows he understands what he remembers by paraphrasing, defining, etc. (p. 15)

C. Problem Solving level: these questions require critical thinking abilities such as analyzing, synthesizing, and evaluating. (p. 17)

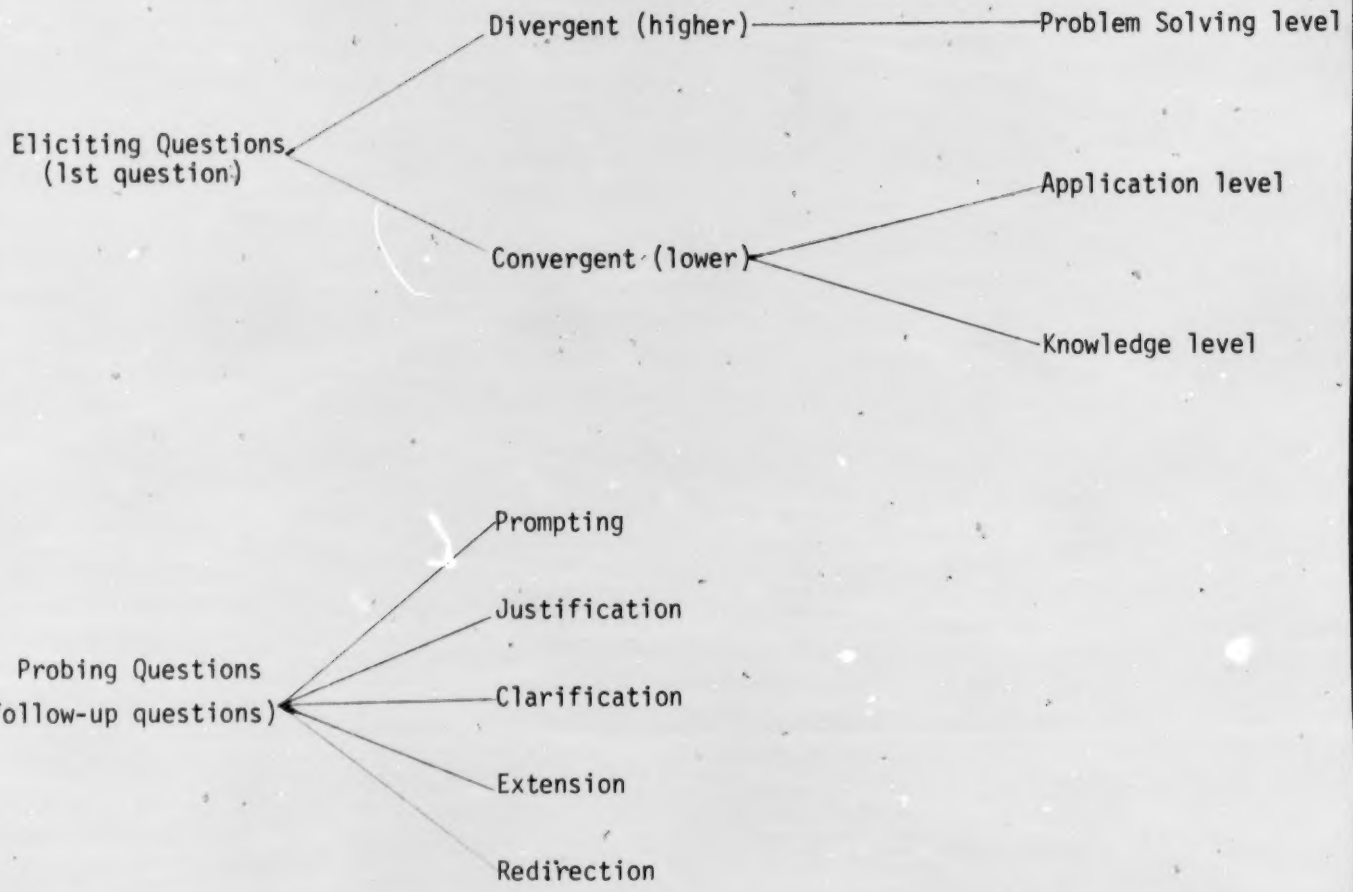
2. Knowledge level questions

3. (See 1.A. above)

4. #2 Knowledge level

#3 Application or Problem Solving depending on your prior knowledge about the answer.

5. a. PS, b. K, c. A, d. A, e. PS, f. A, g. PS, h. PS, i. A, j. PS, k. K, l. A


Eliciting Questions
(1st question)
Divergent (higher)
Problem Solving level
Convergent (lower)
Application level
Knowledge level
Probing Questions
(follow-up questions)
Prompting
Justification
Clarification
Extension
Redirection

C. Probing Questions

Even though an instructor may begin a particular teaching situation with well planned eliciting questions as a part of his lesson plan, there will be occasions when he will need to expand or alter those questions or ask additional questions to get the appropriate student responses.

When the instructor begins a questioning activity by asking an eliciting question, the learning activity can take several directions. There will be either 1) a response or 2) no response to the question. If there is a response, it will be 1) correct or appropriate; 2) partially correct, partially appropriate, or incomplete; or 3) incorrect or inappropriate.

If there is no response, the instructor may wish to restate the question after adjusting its wording and/or structure. Students may not have understood the thrust of the question, in which case rephrasing might clarify what is being asked. Another possibility is that students really do not know the answer to the question. In this situation, the instructor may wish to determine why they cannot answer. Perhaps an assignment has been misunderstood, or a particular portion of the material is beyond the comprehension of the students.

If there is a response which is incorrect, incomplete, inappropriate, or disorganized, the instructor has an option. He can utilize probing questions to guide the student to the desired response rather than correct, complete, clarify, or organize the answer himself for the student responding.

Probing questions can be addressed to the whole class or to an individual student who has responded inadequately in some way to a question. They are

designed to lead students to the articulation of a correct or more appropriate response and aid the instructor in determining depth of student comprehension. Probing questions are more likely to be necessary with higher order questions which require students to manipulate, rather than just remember, information. In addition to stimulating improved or expanded student responses, these questions also serve to increase active student participation and decrease teacher-talk during classroom interaction by allowing more students to respond.

There are five categories of probing questions: prompting, justification, clarification, extension, and redirection. Each category is described on the following pages.

When using prompting questions, the instructor follows up a student's initially weak or incorrect answer with another question or series of questions containing hints or clues to the desired response. These hints provided by the instructor can often trigger the student's thought processes to assimilate the knowledge necessary to respond to the question. Prompting questions can also be used to encourage and support a student who is reluctant to answer because he is afraid that he will respond incorrectly.

The following dialogue shows an instructor's use of prompting to guide a student toward a correct answer.

Instructor: In the experiment the instructions are to use a translucent material. What does translucent mean?

Student: I think it means you can see through it.

Instructor: Well, you can see through a pane of glass, but glass is transparent. You can see through it clearly.

Student: Oh! Then translucent means you can't see through it clearly. It just lets light through but not a clear image.

Instructor: Right.

Justification questions asked by the instructor call on a student to give reasons for his particular response or to explain why he chose to respond as he did. Such questions permit the instructor to determine the student's perception and understanding of his own answer. Often it is important for the student to have not only a correct response to a question, but also to understand why that response is correct.

The following dialogue demonstrates how an instructor determines a student's understanding of the importance of his answer to a question.

Instructor: What is one of the first and most important rules to observe in medical mycology?

Student: To be aware of variations in the host and the infecting fungal agent.

Instructor: What is that so important?

Student: Because there is so much overlap in classifying mycoses. Some of the systemic mycoses can exhibit cutaneous and/or subcutaneous manifestations as well as involvement of internal organs, for instance. So, in order to diagnose fungal disease, we have to isolate and identify the etiologic agent.

Clarification questions are useful when a student has given a poorly organized or incomplete (not incorrect) response. No hints or clues are added to clarification questions. The instructor may simply ask the student to rephrase or explain the response. Clarification questions are used when a student's response is not clear or when it may be misunderstood. An example of such questioning strategy follows.

Instructor: After completing a person's tax form, what do you do?

Student: You make copies and send them off.

Instructor: Ok, but be more specific. How many copies and which copies go where?

Student: You make two xerox copies usually. One is for the individual's personal file and one is for the Accounting Firm's records. The original, of course, goes to IRS.

Instructor: Good.

Both clarification and extension questions are used to keep students on the same train of thought, but to make certain points more explicit and complete. Extension questions ask the student to elaborate on a correct response by providing additional information or a more detailed explanation of the answer. Such questions help both the student responding and the rest of the class to realize what implications are being made in the response and what relationship the response may have to other information. The following dialogue represents an instructor's use of an extension question after the student's initial reponse.

Instructor: Explain the following statement: "The concept of the mole is not only unique to the study of chemistry, but it is a very powerful tool in chemistry."

Student: The ability to determine the amounts of reagents required in chemical reactions is invaluable. The mole provides the link between the relative atomic weight scale and the measurable mass system used in the laboratory.

Instructor: That's right. Would you give us some example of what the mole concept allows us to do?

Student: Well, when given the name of simple inorganic compounds, or when given the name and formula of any compound, we can calculate the molecular weight. Given the same information and a periodic table we can calculate the percentage of each element present in the compound.

Instructor: Very good.

In addition to using the types of questions described in the preceding pages, the instructor may wish to redirect questions by asking the same

question of more than one student. Redirected questions serve the important function of increasing student interaction in the teaching situation. When questions are redirected, more students have an opportunity to contribute actively to the discussion. However, convergent, Knowledge level questions with only one correct answer usually are not redirected.

Instructor: Is the desire to help people a valid reason for entering a health care profession? Mr. Barton?

Student: Yes, I think so. Health care professions are made up of individuals who have chosen, for one reason or another, to enter a field that demands they "help" other people, and that implies concern for and interaction with other human beings. If the desire to help is not there, then the health care worker functions like a robot, doing a technically good job. If he genuinely desires to help a patient, then he is going to interact differently with that patient by showing concern and kindness.

Instructor: Ms Davis, how would you respond to the question?

Student: The desire to help people is certainly a valid reason, but not the only reason . . .

Planning the Questions. Planning questions for use in a particular lesson is an idea that may not have occurred to many instructors. It can be done, however, and will help to make questioning exercises more effective and relevant.

While the instructor plans a lesson, he can also determine if there are appropriate places in that lesson to ask questions that check student comprehension, diagnose student strengths and weaknesses, arouse student motivation, or fulfill any of the other purposes of questioning mentioned in the Introduction to this module.

When it has been determined that questioning is appropriate, the instructor must devote some attention to actually developing specific eliciting questions.

The nature of the questions should depend on the purposes he wants them to fulfill and the levels of thinking he wishes to initiate in the students. If he wants only to assess students' retention of information, Knowledge level questions should be planned. If he wants to determine the students' abilities to transfer and utilize information, he will plan Application level questions. If he wishes to encourage higher order, creative thought processes, he will plan Problem Solving Questions.

Most questions that instructors ask are at the Knowledge level, which means that students are being asked simply to repeat to the instructor what they have learned. The thought process involved is memory. Planning questions at the two other levels (Application and Problem Solving) give students opportunities to exercise higher levels of thinking. Good questions at the higher levels are harder to develop and require more time and effort by the instructor. They should not be left to chance.

Eliciting questions designed to meet specific purposes can be prepared in advance and included in the lesson plan. Specific probing questions usually cannot be planned since they are based on student responses - and student responses are often unpredictable. Remember, however, that probing questions better accomplish the purposes of eliciting questions that have not produced desired responses.

For instance, a nutrition instructor may note in his lesson plan that he wishes to emphasize four factors influencing dietary patterns. He plans an eliciting question based on that portion of the lesson: "What factors influence our dietary patterns?" If the desired response to the eliciting question is not forthcoming, he will continue with a series of probing

questions that enable students to articulate the four factors.

Good questions are not always planned. In some cases the nature and context of the teaching situation will create an appropriate, insightful question that is totally unplanned. But the conscientious instructor will not rely on those chance circumstances; rather, he will plan appropriate questions.

Exercise (Partial Post-Test)

1. Identify and discuss in writing the application of probing questions in general.

2. What are the five types of probing questions? What are the uses of each?

PART B: APPLYING THE CONCEPTS

ANSWERS TO EXERCISE:

1. Probing questions are follow-up questions which elicit further responses from students after an incorrect, incomplete, inappropriate, or disorganized response to an eliciting question. (p. 25)

2. The five types are:

   a. prompting - initially weak or incomplete answer followed by prompting student towards more correct answer. (p. 26)

   b. justification - instructor wants to check if student knows why a response is correct. (p. 27)

   c. clarification - instructor simply asks student to rephrase or reorganize an incomplete or disorganized answer. (pp. 27-28)

   d. extension - instructor asks student to give additional information or examples to his first answer. (p. 28)

   e. redirection - instructor asks same question of more than one student. (pp. 28-29)

I. PRE-TEST (PART B)

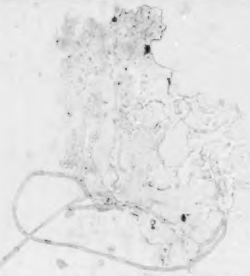
1. Based on the following paragraphs:

   A. Write one convergent question and one divergent question on the first paragraph.

   B. Write one question at each of the levels of questioning (Knowledge, Application, Problem Solving).

War of Independence, U.S.

The War of Independence (1775-83), by which the United States won its freedom from British rule, followed more than a decade of growing estrangement between the British crown and a large and influential segment of the population of its North American colonies, caused by British attempts to assert greater control over colonial affairs. Until early in 1778 the conflict, also known as the American Revolution, was a civil war within the British Empire; afterward it became an international war as France in 1778, Spain in 1779, and the Netherlands in 1780 joined the colonies against Britain. From the beginning sea power was vital in determining the course of the war, lending to British strategy a flexibility that helped compensate for the comparatively small numbers of troops sent to America and ultimately enabling the French to help bring about the final British surrender at Yorktown.



Land Campaigns. Americans fought the war on land essentially with two types of organization, the Continental (national) Army and the state militias. The total number of the former provided by quotas from the states throughout the conflict was 231,771 men; the militia totalled 164,087. At any given time, however, the American forces seldom numbered over 20,000; in 1781 there were only about 29,000 insurgents under arms throughout the country. The war was therefore one of small field armies. Militia, poorly disciplined and with elected officers, were summoned for periods usually not exceeding three months. The terms of Continental Army service were only gradually increased from one to three years, and not even bounties and the offer of land kept the army up to strength. Reasons for the difficulty in maintaining an adequate Continental force included the colonists' traditional antipathy to regular armies, the objections of farmers to being away from their fields, the competition of the states with Congress to keep men in the militia, and the wretched and uncertain pay in a period of inflation.

By contrast, the British Army was a reliable, steady force of professionals. Since it numbered only about 42,000, heavy recruiting programs were introduced. Many of the enlisted men were farm boys, like most of the Americans. Others were unemployed persons from the urban slums. Still others joined the army to escape fines or imprisonment. The great majority became efficient soldiers owing to sound training and ferocious discipline. The officers, who were fairly competent, were drawn largely from the gentry and the aristocracy and obtained their commissions and promotions by purchase. Though they received no formal training, they were not so dependent on a book knowledge of military tactics as were many of the Americans. British generals, however, tended toward a lack of imagination and initiative, while those who demonstrated such qualities often were rash.

Since troops were still few and conscription unknown, the British government, following a traditional policy, purchased about 30,000 troops from various German princes. Approximately three-fifths of this total were furnished by the Landgrave of Hesse. Few acts by the crown roused so much antagonism in America as this use of foreign mercenaries.

In explaining the outcome of the war, scholars have pointed out that the British never contrived an overall general strategy for winning it. Also, even if the war could have been terminated by British power in the early stages, the generals during that period, notably Howe, declined to make a prompt, vigorous, intelligent

application of that power. They acted, to be sure, within the conventions of their age, but in choosing to take minimal risks (for example, Carleton at Ticonderoga and Howe at Brooklyn Heights and later in New Jersey and Pennsylvania) they lost the opportunity to deal potentially mortal blows to the rebellion. There was also a grave lack of understanding and cooperation at crucial moments (as with Burgoyne and Howe in 1777). Finally, the British counted too strongly on Loyalist support they did not receive.

But British mistakes alone could not account for the success of the United States. Feeble as their war effort occasionally became, the Americans were able generally to take advantage of their enemies' mistakes. The Continental Army, moreover, was by no means an inept force even before von Steuben's reforms. The militia, while usually unreliable, could perform admirably under the leadership of men who understood them, like Arnold, Greene, and Morgan, and often reinforced the Continentals in crises. Furthermore, Washington, a rock in adversity, learned slowly but reasonably well the art of generalship. The supplies and funds furnished by France from 1776 to 1778 were invaluable, while French military and naval support after 1778 was essential. The outcome, therefore, resulted from a combination of British blunders, American efforts, and French assistance. (Wallace, 1978:602-605)

Answers: (See page 41)

3. Based on the instructor-student exchanges given below, write appropriate probing questions (clarification, extension, justification, and prompting). Try to use one of each.

A. Instructor: Demonstrate how British conservatism hurt their war effort.

Student: Many of the generals lacked initiative and imagination.

Probe:

Type of Probe: _____

B. Instructor: Trace the general organization of the two American military forces.

Student: There was the Continental Army and the state militia but I don't remember how they were organized.

Probe:

Type of Probe: _____

C. Instructor: Do you see the British imposition of new taxes in the colonies as justified or unjustified?

Student: I think they were unjustified.

Probe:

Type of Probe: _____

D. Instructor: What are some of the reasons for the Americans winning the war?

Student: First of all, the British never contrived an overall general strategy for winning the war.

Probe:

Type of Probe: _____

Answers: (See pages 44-45)

II. Key Concepts

eliciting

divergent

convergent

problem solving level

application level

knowledge level

probing

prompting

justification

clarification

extension

redirection

III. Learning Objectives

Goal: To be able to apply concepts of questioning techniques. After completing this unit, the learner will be able to:

1. Write convergent and divergent questions on given material and on his own subject area.

2. Write questions at each of the three levels of questioning in a given area and his own.

3. Based on given instructor-student exchanges, write probing questions (clarification, extension, justification, and prompting).

IV. Application Exercises (Part I, Post Test)

Read the following paragraph(s). Then assume that you are the instructor who will be responsible for presenting this material to a group of students. Write one divergent and one convergent question on this material. Then write one question at each of the three levels of questioning.

War of Independence, U.S.

The War of Independence, (1775-83), by which the United States won its freedom from British rule, followed more than a decade of growing estrangement between the British crown and a large and influential segment of the population of its North American colonies, caused by British attempts to assert greater control over colonial affairs. Until early in 1778 the conflict, also known as the American Revolution, was a civil war within the British Empire; afterward it became an international war as France in 1778, Spain in 1779, and the Netherlands in 1780 joined the colonies against Britain. From the beginning sea power was vital in determining the course of the war, lending to British strategy a flexibility that helped compensate for the comparatively small numbers of troops sent to America and ultimately enabling the French to help bring about the final British surrender at Yorktown.

Land Campaigns. Americans fought the war on land essentially with two types of organization, the Continental (national) Army and the state militias. The total number of the former provided by quotas from the states throughout the conflict was 231,771 men; the militia totalled 164,087. At any given time, however, the American forces seldom numbered over 20,000; in 1781 there were only about 29,000 insurgents under arms throughout the country. The war was therefore one of small field armies. Militia, poorly disciplined and with elected officers, were summoned for periods usually not exceeding three months. The terms of Continental Army service were only gradually increased from one to three years, and not even bounties and the offer of land kept the army up to strength. Reasons for the difficulty in maintaining an adequate Continental force included the colonists' traditional antipathy to regular armies, the objections of farmers to being away from their fields, the competition of the states with Congress to keep men in the militia, and the wretched and uncertain pay in a period of inflation.

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became efficient soldiers owing to sound training and ferocious discipline. The officers, who were fairly competent, were drawn largely from the gentry and the aristocracy and obtained their commissions and promotions by purchase. Though they received no formal training, they were not so dependent on a book knowledge of military tactics as were many of the Americans. British generals, however, tended toward a lack of imagination and initiative, while those who demonstrated such qualities often were rash.

Since troops were still few and conscription unknown, the British government, following a traditional policy, purchased about 30,000 troops from various German princes. Approximately three-fifths of this total were furnished by the Landgrave of Hesse. Few acts by the crown roused so much antagonism in America as this use of foreign mercenaries.

In explaining the outcome of the war, scholars have pointed out that the British never contrived an overall general strategy for winning it. Also, even if the war could have been terminated by British power in the early stages, the generals during that period, notably Howe, declined to make a prompt, vigorous, intelligent application of that power. They acted, to be sure, within the conventions of their age, but in choosing to take minimal risks (for example, Carleton in Ticonderoga and Howe at Brooklyn Heights and later in New Jersey and Pennsylvania) they lost the opportunity to deal potentially mortal blows to the rebellion. There was also a grave lack of understanding and cooperation at crucial moments (as with Burgoyne and Howe In 1777). Finally, the British counted too strongly on Loyalist support they did not receive.

But British mistakes alone could not account for the success of the United States. Feeble as their war effort occasionally became, the Americans were able generally to take advantage of their enemies' mistakes. The Continental Army, moreover, was by no means an inept force even before von Steuben's reforms. The militia, while usually unreliable, could perform admirably under the leadership of men who understood them, like Arnold, Greene, and Morgan, and often reinforced the Continentals in crises. Furthermore, Washington, a rock in adversity, learned slowly but reasonably well the art of generalship. The supplies and funds furnished by France from 1776 to 1778 were invaluable, while French military and naval support after 1778 was essential. The outcome, therefore, resulted from a combination of British blunders, American efforts, and French assistance. (Wallace, 1978:602-605)

Convergent Question:

Divergent Question:

Knowledge level:

Application level:

Problem Solving level:

Answers:

Convergent question: (Examples)

1. Until early 1778, what kind of war was the conflict between Britain and the colonies?

2. What was the main reason for the growing estrangement between the colonies and Britain before the war?

3. What countries aided the colonial war effort?

Divergent question: (Examples)

1. Assess the probable effects of the two part military system on the American war effort.

2. Consider the fact that Britain hired Hessian mercenaries for this war. Discuss what effects this might have had on the British and American war efforts and what kinds of soldiers the mercenaries might have been.

Knowledge level: (any of the three Convergent questions)

Application level: (Examples)

1. Give several examples of differences between the British and American armies.

2. Trace the organization of the two American military forces.

3. Demonstrate how British conservatism hurt their war effort.

Problem Solving level: (Examples)

1. Propose a plan that would have allowed the British to "deal potentially mortal blows to the rebellion," at various points.

2. Assess the probable effects of the two part military system on the American war effort.

Application Exercises (Part II)

Based on the instructor-student exchanges given below, write appropriate probing questions (clarification, extension, justification, and prompting). Use one of each.

A. Instructor: Demonstrate how British conservatism hurt their war effort.

Student: Many of the generals lacked initiative and imagination.

Probe:

Type of Probe: _____

B. Instructor: Trace the general organization of the two American military forces.

Student: There was the Continental Army and the state militias but I don't remember how they were organized.

Probe:

Type of Probe: _____

C. Instructor: Do you see the British imposition of new taxes in the colonies as justified or unjustified?

Student: I think they were unjustified.

Probe:

Type of Probe: _____

D. Instructor: What are some of the reasons for the Americans winning the war?

Student: First of all, the British never contrived an overall general strategy for winning the war.

Probe:

Type of Probe: _____

_____

Answers:

A. Instructor: Demonstrate how British conservatism hurt their war effort.

Student: Many of the generals lacked initiative and imagination.

Probe: Since the student indicates an example of British conservatism but not how that hurt their war effort, his answer might be unclear or confusing; the instructor's most logical probing question here would be one of clarification. He might ask the student "That's right. But how did that lack affect their war effort?"

B. Instructor: Trace the general organization of the two American military forces.

Student: There was the Continental Army and the state militias but I don't remember how they were organized.

Probe: The student's response indicates to the instructor that the student may have forgotten an answer that he knew at one point. In this instance, then, the instructor may choose to attempt to trigger the student's thinking process by prompting him into remembering the response. He might ask the student:

> "Well, one supplied the other through a quota system. Which one would depend on a quota?" or "One had a short and one a longer period of service. Which one had the shorter period?"

C. Instructor: Do you see the British imposition of new taxes in the colonies as justified or unjustified?

Student: I think they were unjustified.

Probe: To answer the instructor's question, the student must make a choice between two alternatives. The most logical probing question by the instructor as a follow-up would be one that asks the student to justify his answer by giving reasons why he chose that answer.

The instructor might ask: "Why do you take that viewpoint as opposed to saying that they were justified?"

D. Instructor: What are some of the reasons for the Americans winning the war?

Student: First of all, the British never contrived an overall general strategy for winning the war.

Probe: The instructor's eliciting question asks for "some of the reasons"; the student's response includes only one, "First of all ...," indicating that there are indeed more factors. The instructor might wish to ask the student to extend his answer by stating more of the factors involved. He might ask the student: "That's true. What other reasons were there?"

Application Exercises (POST TEST)

Choose some of your own material (a small chunk) and prepare the same types of questions as you've just practiced. If you feel pretty confident with these concepts, combine Divergent with Problem Solving level and Convergent with either Application and Knowledge level.

After writing your questions, check each by going over the characteristics of each type and level using this module and/or discussing your questions with a colleague who has also done this module.

When you have satisfied yourself as to the correctness of the questions, incorporate them by deciding at what points they would best fit into your lesson plan.

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